TABLE 1.—*Monthly and annual amounts and averages of rainfall at Hamilton, Bermuda, 1870–1924*

[Values for 1870–1896 from observations by Mr. Gosling published in the Bermuda Almanack; for 1897–1924 from the Colonial Blue Book, supplemented by investigation of original records at the Prospect Observatory, Bermuda]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1870	5.54	7.00	5.58	3.21	5.20	2.94	1.92	*2.23	7.32	1.18	4.21	5.67	52.00
1871	1.50	1.19	3.21	5.20	3.64	3.63	4.57	4.37	4.65	3.86	5.11	6.06	46.99
1872	4.31	4.17	6.61	6.26	1.28	4.96	9.48	8.03	4.64	6.53	4.12	8.02	68.41
1873	6.72	6.96	6.97	4.41	7.21	2.31	4.46	1.95	1.83	2.46	6.32	5.06	56.66
1874	3.51	4.75	6.43	2.25	2.45	3.83	5.68	11.30	5.85	16.50	5.40	3.25	71.20
1875	2.50	2.56	1.78	5.00	6.33	1.88	4.17	1.75	5.69	6.45	2.42	4.30	44.83
1876	1.66	4.47	5.80	3.51	5.59	8.41	2.56	1.52	7.59	7.00	4.14	7.35	59.60
1877	2.97	11.00	6.13	2.45	6.94	7.01	4.73	8.84	4.45	1.33	6.53	3.43	65.81
1878	5.79	7.80	5.81	3.41	4.10	5.47	5.68	9.69	5.98	5.38	5.78	3.36	68.25
1879	4.64	5.55	5.04	3.52	4.89	4.21	8.59	4.67	5.39	2.76	3.58	3.15	55.99
1880	3.44	4.45	3.07	1.57	3.84	3.20	4.19	6.23	2.70	7.97	5.66	5.99	52.31
1881	3.45	2.89	8.05	3.11	3.30	5.80	7.65	4.44	5.45	3.14	2.67	6.67	56.62
1882	3.80	3.07	4.46	2.47	9.13	3.68	6.74	6.04	6.40	5.87	8.61	4.53	64.80
1883	1.39	0.96	5.64	3.21	6.07	3.52	6.37	3.27	2.76	10.74	3.14	5.99	53.06
1884	3.97	3.43	3.34	4.60	2.37	6.53	5.56	8.07	2.98	4.85	11.78	5.29	62.77
1885	3.94	7.65	9.03	5.82	9.70	1.61	3.24	5.29	2.30	9.25	12.48	5.24	75.55
1886	4.56	7.12	5.76	1.36	2.36	1.48	18.62	5.60	3.98	4.47	5.25	3.63	64.19
1887	6.89	1.60	3.19	3.81	9.45	4.67	2.64	5.08	2.65	2.17	6.73	5.50	54.38
1888	5.82	4.24	3.00	2.47	1.07	7.79	7.28	4.74	3.12	5.98	6.37	8.45	60.33
1889	7.40	6.51	4.43	11.09	13.13	2.32	5.76	4.05	4.64	6.99	1.35	3.90	71.57
1890	1.78	4.01	5.09	3.81	7.54	8.42	5.68	2.04	4.15	6.54	5.54	5.10	59.70
1891	4.07	4.73	7.19	5.60	5.81	5.57	3.25	13.75	8.15	9.72	5.04	0.80	73.68
1892	3.92	6.42	5.43	2.51	0.87	3.86	3.91	6.95	3.45	15.32	5.89	2.91	61.44
1893	6.07	1.73	7.90	2.13	5.95	8.62	3.77	4.35	2.56	1.99	4.09	3.76	52.92
1894	5.81	3.29	2.52	2.59	6.05	3.12	3.39	5.03	9.52	9.13	3.05	5.99	59.49
1895	3.52	5.39	5.49	6.07	2.45	6.97	6.67	2.45	7.88	6.40	3.51	5.75	62.55
1896	6.69	4.99	8.32	1.39	2.76	4.43	1.53	5.22	4.85	5.44	3.45	5.14	54.21
1897	4.42	2.21	2.11	5.80	4.15	7.84	4.94	7.97	3.51	6.82	1.19	3.62	54.58
1898	2.81	4.47	0.62	7.10	1.46	6.20	2.71	3.90	3.41	2.05	5.64	1.45	41.82
1899	5.20	2.80	3.56	5.79	4.20	3.40	6.93	5.38	11.09	1.39	6.82	4.76	61.32
1900	6.92	4.93	4.74	1.47	6.94	4.08	2.19	5.25	7.95	4.07	3.60	8.74	60.88
1901	9.44	4.87	7.82	6.45	1.33	1.63	2.08	1.62	1.37	9.85	7.04	2.09	55.59
1902	3.73	7.41	3.73	12.65	2.95	6.80	1.71	16.54	2.05	10.01	3.16	5.69	76.43
1903	3.37	1.79	3.35	4.54	3.88	4.35	2.05	2.96	7.80	6.26	3.87	6.32	50.54
1904	5.91	3.68	3.28	2.39	9.09	5.42	6.28	4.58	1.60	8.10	2.60	2.38	55.31
1905	3.18	3.20	1.74	6.80	6.16	4.92	5.32	6.38	2.52	5.20	5.50	9.64	60.56
1906	6.70	8.52	6.94	3.32	2.32	2.04	1.00	4.46	3.82	11.74	4.96	5.36	61.18
1907	1.48	5.76	1.58	4.82	3.88	4.82	2.24	3.16	3.34	7.02	1.76	5.48	45.34
1908	4.46	5.78	8.98	4.32	2.62	2.64	2.14	1.82	5.68	9.62	4.24	1.36	53.66
1909	5.16	4.26	4.94	2.06	3.82	2.12	7.46	5.82	15.00	7.66	5.22	5.44	68.96
1910	9.42	4.26	3.00	9.30	5.36	0.88	1.18	0.64	6.50	4.92	3.30	4.38	53.14
1911	1.78	1.18	2.40	1.72	2.82	6.14	1.66	7.24	2.94	1.40	7.00	3.28	39.56
1912	6.54	3.66	4.82	3.28	1.70	2.98	11.24	7.76	1.78	2.16	3.24	2.22	51.38
1913	2.20	5.90	3.34	1.94	1.32	2.10	2.22	8.86	1.84	4.22	11.36	3.68	48.98
1914	6.18	10.40	5.20	3.90	5.16	2.08	1.74	4.78	6.58	4.08	1.04	10.46	61.60
1915	2.84	3.52	6.70	2.36	1.82	10.98	4.37	4.79	16.13	1.33	2.90	2.85	60.59
1916	1.68	5.07	5.44	3.20	1.64	2.12	5.45	5.36	6.98	3.08	7.00	2.54	49.56
1917	3.32	2.56	1.92	1.88	4.18	6.08	3.00	4.82	7.94	17.42	3.06	6.84	63.02
1918	3.80	1.34	2.72	8.80	0.80	7.96	4.54	8.14	7.56	2.88	11.44	4.18	64.16
1919	6.56	3.60	2.17	4.64	2.36	2.82	0.84	6.92	5.62	2.51	4.28	6.52	48.84
1920	4.04	6.26	10.05	1.44	8.46	1.45	3.53	3.60	2.23	3.11	3.80	4.55	52.52
1921	5.99	5.54	1.36	2.57	8.07	2.59	1.50	4.75	4.09	5.03	6.27	6.67	54.43
1922	5.95	3.33	1.67	2.92	3.37	10.26	2.95	3.87	6.90	5.81	3.67	3.16	53.86
1923	4.40	3.23	4.71	4.05	5.14	1.62	2.27	2.40	4.40	5.18	5.31	2.52	45.23
1924	3.17	5.61	6.68	3.34	5.19	4.65	7.66	6.14	3.84	4.77	4.01	1.57	56.63
Means	4.48	4.60	4.74	4.10	4.54	4.49	4.53	5.40	5.19	5.95	5.01	4.78	57.80

TABLE 2.—*Average monthly and annual number of days with rainfall of 0.25 inch or more and 0.01 inch or more, Hamilton, Bermuda, 1897–1924*

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
0.25 inch or more [1]	6	5	5	4	4	4	4	6	5	6	5	5	58
0.01 inch or more [2]	16	14	13	11	10	11	12	14	13	14	15	15	158

[1] Means derived by W. H. Potter from the original unpublished records.
[2] From the records of the Prospect Observatory as published in the Blue Books of the colony. This table is given "as the records were made, but it is apparent from the original records that all rainfalls under 0.02 inch were recorded as 'trace' in the earlier years, so the number of 'rainy days' is somewhat less than it should be."

TABLE 3.—*Amounts and averages, by months, of the greatest daily rainfall, Hamilton, Bermuda, 1897–1924*

[From the records of the Prospect Observatory as published in the Blue Books, supplemented by investigation of the original records]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1897	0.82	1.11	0.65	2.46	1.32	2.42	2.20	2.15	0.90	2.50	0.41	1.62	2.50
1898	1.12	1.70	0.48	1.90	0.40	1.15	0.82	1.06	1.08	0.47	1.90	0.40	1.90
1899	1.30	0.72	0.92	1.46	1.15	2.50	3.35	1.10	3.73	0.75	3.54	2.26	3.73
1900	2.30	1.02	0.93	0.46	1.52	1.64	1.01	1.52	2.74	1.50	0.84	2.87	2.87
1901	3.02	1.45	4.80	2.37	0.42	0.44	0.80	0.37	0.22	2.41	1.52	0.67	4.80
1902	1.06	3.28	0.94	10.75	0.80	4.70	0.55	3.08	0.81	3.21	1.77	1.43	10.75
1903	0.65	0.71	1.02	1.50	2.17	1.68	1.02	1.01	4.55	1.70	1.18	1.00	4.55
1904	1.04	0.92	1.14	1.82	3.30	1.56	1.10	1.02	0.54	1.54	0.58	0.84	3.30
1905	0.50	0.70	0.64	3.12	3.90	2.06	1.04	1.20	0.96	1.70	0.72	4.64	4.64
1906	2.48	1.94	1.96	0.96	1.36	1.40	0.48	1.12	1.44	3.16	3.10	1.04	3.16
1907	0.54	1.12	0.62	1.80	1.04	1.52	1.20	0.86	0.78	2.16	0.64	1.38	2.16
1908	1.12	1.44	5.86	1.90	0.94	0.88	0.50	0.56	2.02	2.78	1.58	0.26	5.86
1909	3.16	1.46	0.88	0.86	0.92	0.80	1.74	2.90	6.58	2.90	1.20	0.78	6.58
1910	3.84	1.64	1.34	4.96	3.36	0.30	0.40	0.20	1.96	2.60	0.86	1.36	4.96
1911	0.48	0.30	0.50	0.96	1.48	1.56	0.44	1.94	1.62	0.78	2.44	1.24	2.44
1912	1.56	1.22	1.40	1.32	0.52	0.70	2.76	1.66	0.66	0.84	1.00	0.42	2.76
1913	0.56	1.16	0.86	0.56	0.72	0.66	0.78	2.72	0.76	1.04	3.62	1.08	3.62
1914	1.90	2.72	1.22	1.18	3.06	0.72	0.64	1.64	2.26	1.40	0.34	1.68	3.06
1915	1.00	0.80	1.56	0.88	0.48	2.38	2.89	2.61	6.06	0.42	0.93	0.59	6.06
1916	0.50	1.59	1.19	1.11	0.87	0.79	1.41	2.79	2.14	1.98	1.96	0.72	2.79
1917	1.36	0.74	0.44	0.66	1.20	2.08	1.70	0.76	2.46	5.04	0.80	1.24	5.04
1918	1.14	0.52	1.02	2.42	0.48	1.54	1.70	2.38	3.24	0.62	3.20	2.56	3.24
1919	1.22	0.58	0.44	1.16	1.72	0.82	0.32	1.64	1.36	0.86	0.82	0.98	1.72
1920	0.76	1.44	1.70	0.44	5.09	0.82	1.18	0.97	0.46	1.44	1.30	0.92	5.09
1921	2.50	3.30	1.03	1.16	5.50	0.80	0.70	1.64	0.94	2.04	1.98	1.90	5.50
1922	1.02	0.92	0.36	1.36	2.14	8.00	0.72	1.46	4.91	1.49	0.84	0.76	8.00
1923	1.10	0.98	0.91	1.14	2.29	1.36	0.86	0.72	1.79	2.28	1.00	1.50	2.29
1924	1.30	1.88	1.85	1.20	1.44	2.15	3.12	2.10	1.88	2.74	1.04	0.66	3.12
Means	1.41	1.33	1.31	1.85	1.77	1.69	1.27	1.54	2.10	1.87	1.47	1.31	4.16

NOTES, ABSTRACTS, AND REVIEWS

SOLAR-CONSTANT VALUES

Values of the solar constant were last published in this REVIEW for February, 1923.[1] Doctor Abbot has just issued a report under the title "Provisional Solar-Constant Values, August, 1920, to November, 1924,"[2] which brings the record of daily solar constant values down to the end of November, 1924. Doubtless a copy of the report can be supplied by Doctor Abbot, whose address is Smithsonian Institution, Washington, D. C.—EDITOR.

THE METEOROLOGICAL WORK OF THE "JACQUES-CARTIER"

By E. DELCAMBRE, National Meteorological Office of France

[Translated from *Comptes Rendus*, 179, No. 23, December 8, 1924, pp. 1337–1339, by B. M. Varney, Weather Bureau, Washington]

The Compagnie Générale Transatlantique and the National Meteorological Office of France, in cooperation, have organized and developed continuously since 1921 a special meteorological service on board of the *Jacques-Cartier*, school ship for the regular transatlantic service. The object of this note is to summarize briefly the principal results so far attained.

1. *The extension of the réseau of synoptic observations assembled by radio for purposes of forecasting on land.*—The uninterrupted reception on a continent, of the international observations made four times daily on shipboard during an entire Atlantic crossing, was realized in January 1923 from the *Jacques-Cartier* en route from Le Havre to New Orleans. In the eastern Atlantic, transmission to Brest is direct; in the western Atlantic or in the Pacific, a relay via Washington is necessary.

Still more important is the fact that the *Jacques-Cartier* is the first floating station for the assembling and retransmission to land, of the observations made on other ships. This organization is extremely useful because, first, most ships are equipped only with wireless sending apparatus which is too weak to permit of reaching the mainland unless the vessel is fairly close to the coast, second, the necessities of commercial traffic are usually incompatible with the difficulties and the loss of time

[1] Values of the solar constant, 1920–1922, by C. G. Abbot and colleagues. MO. WEA. REVIEW 51: 71–81.
[2] Smithsonian Misc. Coll. 77: No. 3.

involved in establishing shore connection. The activity of the *Jacques-Cartier* in this respect has been constantly increasing. During the return voyage of March–April 1924 (Vancouver to Bordeaux) she received 61 observations from French ships and 338 from foreign ships of all nationalities. Certain of these vessels kindly acted as relay stations for the picking up of observations of ships still more distant. On the Atlantic the observations received averaged some 30 per day.

This network of oceanic observations, of an extent and closeness hitherto unknown, reaches Paris simultaneously with the regular observation of the *Jacques-Cartier*, and France insures their being broadcast throughout Europe by incorporating them in the meteorological message sent from the Eiffel Tower.

Very recently (November, 1924) a still greater advance has been achieved by the use of very short wave lengths (115 meters). The meteorological messages from the *Jacques-Cartier* have been received at Paris directly, during a complete Atlantic crossing (Bordeaux to Panama), and even, at certain hours, when the ship was in the Pacific.

2. *The work of a floating station for the forecasting of ocean weather.*—In addition to the ship observations which it collects, the *Jacques-Cartier* has at its command the European and American meteorological radiograms received on board.[1] Charts, sometimes more correct over the ocean than over the land, can therefore be regularly drawn twice a day on board, a fact which allows the working up of weather forecasts *on the spot* (an enormous technical advantage) and the broadcasting of them by radio for the great trans-Atlantic routes. Westbound ships experience frequent and rapid changes of weather, and such forecasts have for them a special interest. In the case of the fast eastbound liners, they are not passed by more than one depression at most, even in winter. Hence it is sometimes possible to indicate for them, as early as the time of their leaving port, the broad characteristics of the weather changes for their whole voyage. The forecast service of the *Jacques-Cartier* has become steadily more popular at sea. Thus in bad weather it is not uncommon for vessels in the neighborhood to cease sending in order to listen to her message; and frequently special forecasts are asked for.

It is the value of these forecasts, based on the modern methods developed in France and Norway, which assures the growth of the *Jacques-Cartier's* "station" network, through its "clients" for the receipt of weather forecasts becoming its "purveyors" of observations.[2]

The forecast studies on board of the *Jacques-Cartier* have advanced our knowledge of dynamic meteorology. From these studies, the results of which will be presented in due time by their authors, Mm. Coyecque and Wehrlé, we may for the present draw two general fundamental conclusions: (1) The conception that the Atlantic Ocean acts as a barrier (écran) [to the passage of disturbances from North America to Europe], is no longer tenable; the progress of perturbations is continuous across the Atlantic. (2) The action of the polar front makes itself felt at times down to the region of the Equator; the trade winds are only approximately "permanent."

[1] The sending from the Eiffel Tower of messages on very short wave lengths permitted in November, 1924, the communication direct to the *Jacques-Cartier* of the meteorological situation over Europe during the entire Atlantic crossing.

[2] Mention should be made also of the hearty cooperation of the U. S. Weather Bureau in giving very efficient publicity to the work of the *Jacques-Cartier* through the medium of the Pilot Charts. [For two notes descriptive of the meteorological activities of the ship, see North Atlantic Pilot Chart for March, 1923, "Storm and Weather Forecasting on the Atlantic Ocean"; and for December, 1924, "Meteorological Service of the *Jacques-Cartier*." The bulletin of the National Research Council for January, 1924, pp. 100, 101, contains a note by E. H. Bowie on "The meteorological work of the *Jacques-Cartier*."—B. M. V.]

The success of the tests made by the *Jacques-Cartier* has demonstrated the possibility and the utility of a service which shall collect observations and make forecasts for the Atlantic area. Since 1923 the International Meteorological Committee has given its support and its official recognition to the project. The proper thing now is to organize this service definitely through international cooperation.

HATTERAS DEPRESSIONS

By M. COYECQUE and PH. WEHRLÉ, National Meteorological Office of France

[Translated from *Comptes Rendus*, 179, No. 26, December 29, 1924, pp. 1617–1620, by B. M. Varney, Weather Bureau, Washington]

1. *The facts, based on observations on board the "Jacques-Cartier."*—The region off Cape Hatteras distinctly constitutes a birthplace of atmospheric disturbances. A faint nucleus of barometric depression appears, at first almost stationary. It grows, accompanied by the development of a heavy A. St. Finally the Hatteras depression, with isobaric system fully formed, begins to move slowly toward the northeast, but does not reach normal velocity until it is opposite Nantucket Island. Opposite Newfoundland it turns definitely toward the east, thus getting into line with the series of polar LOWS (depressions along the polar front, properly so called), either merging with one of the latter or maintaining its own individuality. Hatteras depressions affect almost the whole of Europe, and at times extend into rather low latitudes. They are usually intense enough to cause gales from northeast around to northwest in American waters from Hatteras to Newfoundland. The storm connected with the Hatteras LOW may traverse the Atlantic (e.g., January 8, 1924).

The frequency of the Hatteras depressions is of the order of 20 per year. Their formation is almost entirely confined to the cold season. It always induces the movement, out of the north or northwest, of an intense high-pressure center with a complete anticyclonic circulation. The depression appears along the border zone, between the warm air current from the southwest directed by the Atlantic anticyclone and the cold current from the easterly sector controlled by the moving anticyclone.

The process may, however, develop somewhat differently, the depression being extremely weak (sometimes even lacking a cloud system), and moving slowly from the west to the region opposite Hatteras, where it begins rapidly to become more intense. A secondary Hatteras depression and even sometimes a tertiary of decreasing intensity, is sometimes related to the same high pressure center.

2. *Interpretation.*—The strong high-pressure center essentially represents an invasion of polar air,[1] and the formation of the Hatteras LOW is due to the contrast between the temperature of this air and that of the very warm tropical air above the Gulf Stream; hence the geographic localization. But in summer the polar air is warmed over the continent; hence the seasonal localization.

Two types of Hatteras depression should be recognized: (*a*) The LOW formed at the expense of the mother cyclone, which, as in the case of the April 19, 1922, cyclone, disappears. This type of Hatteras depression is characterized by the presence in its northern sector of a very clear line of discontinuity (thus forming an extra front resembling

[1] See J. Bjerknès and K. Solberg, The Evolution of Cyclones. Memoir of the National Meteorological Office of France, No. 6, 1924, pp. 95 ff.